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Free-Choice Learning at a Metropolitan Zoo

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Free-Choice Learning at a Metropolitan Zoo

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Abstract

This paper reports on an inquiry into the use of zoos as a source of informal or free choice learning. The study was contexualised within the zoo's environmental enrichment program - an animal husbandry principle that seeks to develop species-typical behavior for captive animals by using naturalistic enclosures or artificial items that stimulate animal interest. Visitor perceptions and actual use of the zoo were investigated using structured interviews that elicited perspectives of the nature and character of zoo settings and included the use of photographs of selected exhibits to induce stimulated recall. These data were triangulated with unobtrusive observation at selected exhibits. The visitors' spent little time at a given exhibit, and rated the more naturalistic or enriched exhibits more favorably, but older visitors seemed less concerned with naturalness of exhibits. The zoo considers that it has an important role in education and provides many opportunities for learning for general visitors and school groups. General visitors and school groups see the prime purpose of their visit to be entertainment. The learning of science is limited for general zoo visitors and enhanced for school children by pre- and post-visit activities and strong links to curricula.

Introduction

Zoos, along with museums and interactive science centers are potential sources of what has been referred to as informal or flexible learning (Rennie, 1994; Rennie & McClafferty, 1996). Dierking and Griffin (2001) suggest a more appropriate term is free choice learning, that is, learning that is self-directed, voluntary, and rather than following a set curriculum, is guided by a learner's needs and interests and we have retained this term for this inquiry. Environmental enrichment (an animal husbandry principle that seeks to develop species-typical behavior for captive animals by using naturalistic enclosures or artificial items that stimulate animal interest) has the opportunity to enhance access to such learning by making zoo visits more enjoyable. It seems unlikely that free choice (or any) learning can occur if visitors (including those specifically there for the purpose of learning) find exhibits unpleasant or off-putting (Rennie, 1994). Here we propose that visitor perceptions of the zoo, of zoo exhibits, and animal happiness, provide a link between environmental enrichment efforts by the zoo and free choice learning. This raises the question as to what role, if any, zoos, museums and other settings such as interactive science centers can play in

the learning of science. Dierking and Griffin (2001) and others have found that school students consider visits to museums and science centers be for the purpose of entertainment, and believe learning is confined to classroom activities (see also, Rennie, 1994). However, there is little research reported in the literature about zoos and zoo visits.

Objectives of the Inquiry

The research reported in this work sought to gain an understanding of zoo visitors' perceptions of zoo environment for a small metropolitan zoo, and to ascertain its potential as a source of free choice learning. Specifically, the research sought to address the following research questions:

1. What are zoo visitors' perceptions of the zoo?
2. Why do zoo visitors and school groups visit the zoo?
3. Do zoo visitors expect to learn anything about; zoos generally, animals generally and specific animals, conservation, protection of endangered species, and specific breeding programs during zoo visits?
4. What contribution, if any, does a zoo visit make towards the learning of science?
5. How does a visit to the zoo fit in with what is happening in school classrooms?

Theoretical Underpinnings

Traditional evaluation frameworks for free choice learning activities have treated the center itself in an isolated context. Researchers have tended to assess the educational capability of the center only by considering the activity that occurs during the visit. St John and Perry (1993), however, have proposed a new framework for evaluation research in science centers and other free choice science settings that places these venues within a wider social, cultural and educational context. Their framework encourages a reconceptualization of the center, not as an isolated educational setting, but as a part of a nation's educational infrastructure:

> 'Infrastructure' refers to something that... provides critically important support to a wide range of economic and social activities.... Just as the economic health of a nation depends on the strength of its infrastructure, so the scientific and educational literacy of the nation depends on its educational infrastructure. (St John & Perry, 1993, p. 62)

St John and Perry (1993) have suggested four criteria as guides for evaluation of museum, zoos and science centers. First, is analysis of actual use of centers as educational resources. For example: Who actually uses centers? How, and for what purpose? What resources and services does the center provide which are unavailable from other sources? Are these likely to augment school learning? Second, is analysis of center user perceptions and satisfaction. For example: How do users perceive the quality of resources provided by a center? What do users value about these resources? What needs or demands do users have of the center? Third, is analysis of design

characteristics of the center. For example: Do centers have long-term utility and accessibility? Are they attractive to people of different ages, levels of interest, and experience? Does their design allow for flexibility and adaptability of use? Are programs and resources designed to support other educational functions? Will exhibitions/programs provide an opportunity to encounter ideas/issues/personal experiences of science not available elsewhere? Fourth, is analysis of societal benefits of the center. For example: Is the center a marketable, cost-effective resource? Does it serve the public good? How does it fit into the array of existing educational resources? How does it help institutions and individuals in a way that strengthens the overall system of science education? Is it likely to lead to the development of stronger, more positive relationships with the ideas, processes, phenomena and issues of science?

Context

The Mission Statement for the Zoo is: "The Zoo is committed to the delivery and further development of a high quality modern zoological garden which emphasizes conservation education and recreation. This will be delivered in a context that is family orientated and considered value for money." The zoo comprises some 35 acres (ca. 14 hectares) and over 550 species of New Zealand and exotic animals. Species housed include reptiles, primates, tigers (with cheetahs to be introduced in the short-term) and a variety of native and exotic birds. Zoo exhibits are readily accessible with smooth pathways linking all exhibits, although some are rather steep in places making wheel-chair access difficult. Thus, with a few exceptions, the exhibits are generally viewable and accessible for a diverse range of visitors. The zoo was established almost 30 years ago and has made a variety of efforts to enhance animal welfare and appearance of the exhibits, primarily focused on exhibit design with older exhibits (e.g., spider monkeys) having enrichment items such as high frames, and the more modern exhibits containing natural items such as free flowing water and native fauna. The zoo is a contributor to a number of species management programs for endangered species (e.g., the *Australasian Species Management Programme*) and providing model habitats. The staffing consists of a manager, curator, education officer, and seven full time zookeepers, along with a number of volunteers who assist with guided 3urs. The zoo's documentation states that the zoo has important roles in conservation and specific breeding programs, along with education – targeted specifically at primary and secondary school age children (age range 5-17 years).

Methodology

The study was contextualised within the zoo's infrastructure and management model. Zoo facilities were examined in terms of environmental enrichment using as a guide the model of Shettel-Neuber (1988). The zoo exhibits were classified as *First Generation* which are basic enclosures with little or no enrichment (e.g., animals are displayed in small, side-by-side, barred cages), *Second Generation* which are closer to the natural setting or which contain enrichment stimuli (e.g., cement enclosures surrounded by dry or water filled moats to contain animals and containing artificial structures) and *Third Generation* which display animals in their species-natural groups in exhibits that contain vegetation and land formations that attempt to simulate the animal's home region (Campbell, 1984). Design must also take account of visitor

accessibility (e.g., for disabled people) and zoo management implications (e.g., maintenance, cost, etc.). Hence, data were gathered from interviews with zoo management and by inspection of exhibits for accessibility (e.g., ramps, steps, etc.).

First, we sought to gain a very general understanding of visitors' perceptions of the zoo, the animals, environmental enrichment, and why visitors go to the zoo, with no prior assumption that they see zoo visits as a source of learning. These perceptions were measured using structured interviews. There were a total of 80 visitors interviewed, chosen purposefully to provide a reasonably even gender balance and spread of ages. A comprehensive answer to the research questions requires investigation of each of the three stakeholders, the animals, the zoo visitors and zoo staff (including zoo volunteers who take visitors on tours and are available to answer questions at specific exhibits). Hence, evaluation of actual use is also linked to design characteristics for exhibits, and these data were obtained via a physical inspection of the zoo facilities and interviews with zoo staff, and the zoo educational officer, as well as the visitors (St. John & Perry, 1993). The zoo visitor perceptions were triangulated by the use of stimulated recall using photographs of specific exhibits (Figures 1-9), in which visitors were asked to rate selected first, second and third generation exhibits on a seven-point scale from 'very natural' to 'very unnatural'.

Next was the issue of learning and what role free choice settings like museums, science centers, and, in the case of this inquiry, zoos, can play in the learning of science for general zoo visitors and school groups. Data about potential learning experiences were gathered during the structured interviews of general zoo visitors (as described above) and additional semi-structured interviews of secondary school teachers and their students, a primary school teacher and two cohorts or primary students (in small groups) triangulated by observation of these classes during a zoo visit (Anderson et al., 2000; Piscitelli & Anderson, 2001). Both primary and secondary children were asked about their expectations of an actual zoo visit, and probed as to their views of how the zoo visit fitted into classroom activities. Their perceptions of the zoo visit also were elicited using post-visit interviews. Teachers' objectives for the visits were similarly elicited and perceptions of the actual visit developed from post-visit interviews. These data were triangulated with classroom observation of pre- and post-visit activities, examination of children's work that was related to their zoo visit, and unobtrusive observation of teachers, parent helpers and children on their zoo visits.

Inquiry tools also sought to draw upon general tools well documented in the education and science education literature (see, e.g., Cohen et al., 2000; Patton, 1990), but incorporating recommendations of previous research of other free choice learning centers. Shettel-Neuber (1989) recommend developing an understanding of visitor perceptions using a variety of tools including mapping of time spent at exhibits with surveys – namely, by concurrent mapping of visitor and animal behavior. For example, visitors may spend more time at an exhibit if the animals are active, and less if they are sleeping. The influence of species also needs consideration: for example, larger animals may attract more attention than small animals, and primates more than birds (Bitgood et al., 1988; Rhoades & Goldsworthy, 1979). Consequently, the specific enclosures used in the study sought to provide a variety of environmental enrichment levels and spread of animal species.

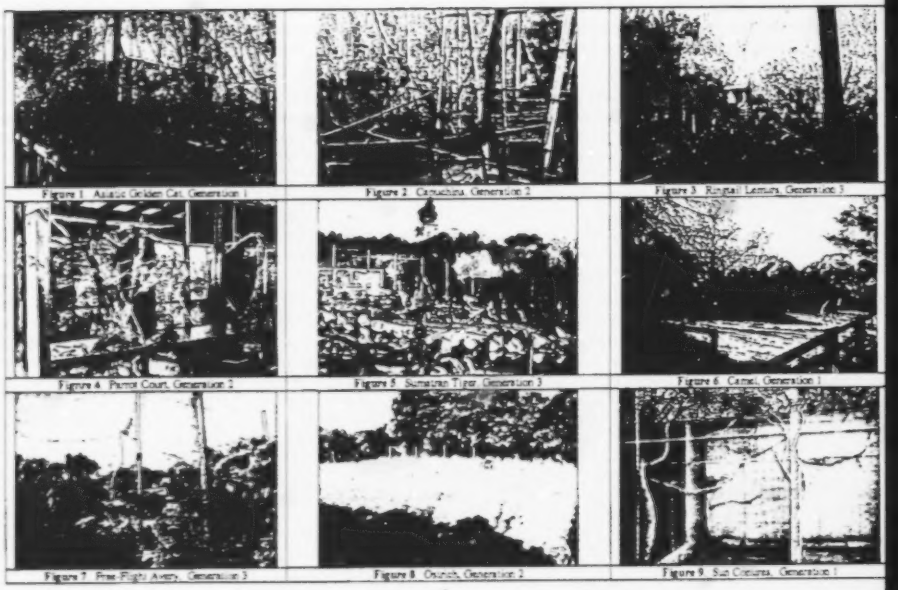

Figure 1. Asiatic Golden Cat, Generation 1
Figure 2. Cotuchina, Generation 2
Figure 3. Ringtail Lemurs, Generation 3
Figure 4. Parrot Court, Generation 2
Figure 5. Sumatran Tiger, Generation 3
Figure 6. Camel, Generation 1
Figure 7. Free Flight Aviary, Generation 3
Figure 8. Ostrich, Generation 2
Figure 9. Sun Conures, Generation 1

Table 1
Estimated means for visitor rating of exhibits (n=80)

Exhibit	Asiatic Golden Cat	Capuchins	Ring-Tail Lemur	Parrot Court	Sumatran Tiger	Camel	Free Flight	Ostrich	Sun Conures
Generation	1	2	3	2	3	1	3	2	1
Age Group[1]									
0-20	2.12	3.93	2.46	4.06	2.31	3.81	1.18	3.00	4.87
21-30	3.61	3.05	1.83	3.16	2.56	4.21	1.17	2.16	4.11
31-40	3.42	4.07	2.46	4.00	2.73	4.79	1.27	3.33	5.08
41-50	3.40	3.53	2.07	3.40	3.00	4.53	1.47	2.47	4.67
50+	2.60	2.07	1.87	3.07	1.93	3.64	1.31	2.20	3.00
Total	3.04	3.32	2.10	3.54	2.51	4.19	1.27	2.61	4.32

[1]N=80, with similar numbers across each age range

Table 2
Estimated means for visitor rating of animal happiness (n=80)

Animal	Asiatic Golden Cat	Capuchins	Ring-Tail Lemur	Parrot Court	Sumatran Tiger	Camel	Free Flight	Ostrich	Sun Conures
Generation	1	2	3	2	3	1	3	2	1
Age Group[1]									
0-20	3.37	2.37	2.25	3.12	1.87	3.56	1.87	3.06	2.87
21-30	4.65	1.68	1.87	3.06	2.53	3.79	2.33	2.44	2.47
31-40	4.60	1.80	1.58	3.20	2.53	3.73	1.64	2.40	3.23
41-50	3.73	1.67	1.76	2.20	2.07	4.07	1.38	1.87	2.53
50+	3.67	1.47	2.00	2.43	2.31	2.71	1.25	1.93	1.40
Total	4.01	1.80	1.89	2.82	2.27	3.59	1.70	2.35	2.49

[1]N=80, with similar numbers across each age range

Table 3
Examples of curriculum links associated with zoo school visits

Level[1]	Science Curriculum Achievement Objectives	Suggested Zoo Focus
1	Share their experience relating to the living world and group the living world according to some of its attributes	Body coverings: skin, feathers, scales
4	Investigate and classify closely related living things on the basis of easily observable features	Primates, birds, camel, llama and reptiles
8	Make informed judgments involving the social, ethical, and moral considerations relating to contemporary biotechnological issues	Role of zoos, captive management techniques

	Technology Curriculum Achievement Objectives	Suggested Zoo Focus
1	Ask questions about how a particular group of people carry out technological activities	Enclosure design
6	Investigate and describe how systems work together as part of a larger system	Enclosure design
7	With reference to identified needs, opportunities and preferences, review the chosen strategies and outcomes with reference to factors such as society, environment, finances, standards and regulations	Zoo technology challenges

[1]The New Zealand science curriculum comprises six strands with eight different levels ranging from new entrants (age 5 years) to year-13 (age 16-17 years).

Results and Discussion

Visitor Perceptions of the Zoo

The zoo visitors were first asked open-ended questions seeking to understand which exhibit and animal they liked most, and which they liked least. Respondents were also probed as to reasons for their choice. The most popular exhibits were the Sumatran tiger (48%) the rhinoceros (18%) and the free-flight aviary (18%). The tiger exhibit was described as "realistic," "nice and open" and "easy to see everything", with "plenty of room for them to hide and play." The free-flight aviary was seen to have "plenty of room to fly" meaning that it "makes you feel like you are in nature." It is worthwhile to note here that the tigers have only recently been added to the zoo, and their presence has been subject to substantial advertising in the local media.

The least popular exhibits were the Asiatic golden cat (25%) reptile house (15%) and parrot court (10%). The golden cat exhibit was described as "dark and wet" being "too small" and the "least interesting because it is such a little cage" with the animal not having "enough space, still walking and pacing." The parrots "needed more room" and the exhibit was seen as "not as natural" as others.

Interestingly, mostly the same exhibits were highlighted when visitors were asked to rank specific exhibits as very natural or unnatural (i.e., Figures 1-9); namely, the Asiatic golden cat, the rhinoceros and Sumatran tigers.

It is possible that the respondents were simply responding to the aesthetic appeal of the colored photographs, so they were also asked if they had visited the exhibits in Figures 1-9 and if they had seen the animals in these exhibits and data omitted where appropriate. These data suggest that both younger and older visitors seemed less concerned about exhibit design with the most critical audience being those aged 21 though 41 years (Table 1).

The respondents were also asked to state which animals they most liked and disliked in another series of open-ended questions. The purpose of this was to ensure that data for the rating of exhibits was not confounded by strong likes and dislikes of specific animals. The most popular animals were the rhinoceros (31%), Sumatran tiger (21%), capuchins (11%) and otters (11%). The rhinoceros was liked because of its size, "it is an impressive animal." Hence, perceptions of the rhinoceros exhibit may have been influenced by the size and nature of the beast. It is worthwhile to note that the exhibit design for the rhinoceros is such that visitors were able to get very close to these animals (within a few meters); hence their popularity may be a feature of both the animal and exhibit. It is interesting that despite being housed in a second-generation exhibit, the capuchins were well liked by the visitors. The capuchins and otters were liked because they were "more active and visible" and the visitors could view them "swinging" and "eating."

Views on the least popular animals were more mixed, with some respondents reluctant to say they disliked any animal, saying they "liked them all." Overall the reptiles were most disliked (21%), followed by ducks and parrots (both 15%). In contrast to the capuchins and other monkeys; the reptiles were seen as "boring" because they "don't do anything." However, these data for the visitor perceptions of the reptiles need to be treated with caution since exhibit design may be part of the

problem, in that most complaints were that these animals were "hard to see, I can never find them."

Again, to check data triangulation, visitors were asked to rate selected animals (the same as in Figures 1-9) on a seven point scale from very happy to very unhappy (Table 2).

These data are consistent with the open-ended questions, showing that the Asiatic golden cat and camel were deemed unhappy, whereas the birds in the free-flight aviary and the ring-tailed lemurs were rated happy. Interestingly, the capuchins, whose exhibit was not rated particularly natural (Table 2), were seen as happy (Table 3). The most likely explanation for this is their activity compared with many of the other animals, for example, the Sumatran tigers, which are commonly inactive during the daytime. With the exception of the sun conures and camel (which they rated as happy), older visitors held similar views to their younger counterparts.

Actual Zoo Use and Visitor Reasons for Visiting the Zoo

The research findings for this inquiry suggest that, as reported for museums and interactive science centers, zoo visitors main purpose for visits is entertainment, with some 81% respondents stating they visited for 'fun'. However, visitors also stated that they perceived the zoo to possess roles in education (59%), much higher than that compared with conservation (24%), specific breeding programs (9%) and protection of endangered species (24%). These latter activities represent potential learning experiences and objectives, but it seems the participants do not see this as an important role for the zoo, or seek out such knowledge and equate this with learning within the context of their own visit. The respondents reported that they read signs about animals and breeding programs, and so forth, although this was not borne out by observational data, with only 29% of visitors observed reading signs. Thus it seems that the general zoo visitors in this study pay cursory attention to educational signs. Most visitors said they came to see animals generally (68%) rather than specific animals. The observational data revealed that although visitors spent more time at two of the enriched exhibits (the free-flight aviary and the Sumatran Tiger), 75% of visitors spent less than three minutes engaged at any given exhibit, even popular exhibits like the Sumatran tiger - despite the fact that 79% of the time the animals were either moderately or very active. Interpretation of such data should be viewed with some caution, however, since Shettel-Neuber (1989) point out that short viewing times are not necessarily indicative of lack of enjoyment, and so should not be taken to indicate enrichment has failed to enhance visitor perceptions.

The Zoo as a Source of Free Choice Learning

We begin the discussion of the zoo's actual and potential role as a source of free choice learning with a discussion of the opportunities and perceptions for general visitors; this is followed by a description of an in-depth case study of a school visit involving two classrooms from the same primary school.

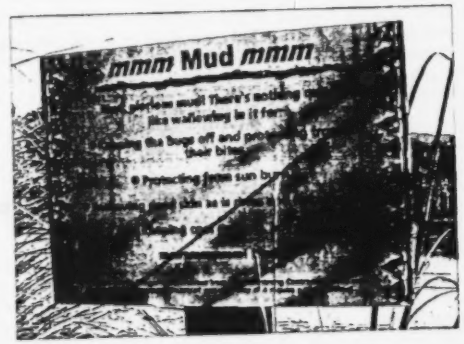

Figure 10
Sign in the rhinoceros enclosure

The zoo provides a variety of opportunities for visitor learning, many of which are strongly linked to their enrichment program. Virtually all exhibits contain signs. There are two types of signs; the first is intended to inform visitors about animals, animal conservation efforts in general, and specific animal conservation and breeding programs at the zoo. For example, the rhinoceros exhibit contains general signs helping to inform visitors about 'mud' and the function this holds for this animal in the wild (Figure 10).

Such a sign is intended to convey information about the animal in its natural habitat and is dependent upon the nature of the actual exhibit. This exhibit is a generation three, that is, it is deemed to be a reasonable representation of the natural setting for a rhinoceros and contains a number of objects for enrichment such as a mud pool, small logs for rolling, larger logs for rubbing against, and so forth. Likewise, the free-flight aviary (Figure 7), another generation three exhibit, contains a large sign near the entrance, detailing and developing the concept of environmental enrichment for visitors.

The second type of sign attempts to help visitors bond with animals, by, for example, making the threat of extinction highly evident. An example of this is again in the rhinoceros exhibit that, in addition to the general signs described above, contains smaller signs that plot the animal's progress throughout its lifecycle, highlighting issues and activities that threaten or enhance its chances for survival (Figure 11).

Figure 11
Rhinoceros exhibit signs, following the lifecycle of a rhino:

a) Sign "Very bad drought increases competition for food, the predators become bolder, lose 5 Energy Points."
b) Sign "The presence of conservation workers deters poachers. You are safe to roam and graze"

The zoo provides a comprehensive zoo volunteers network with close to 40 volunteers, available at peak times such as weekends and school holidays. Such volunteers are generally stationed near exhibits, and engage visitors in conversation about the animals and other issues such as conservation and specific breeding programs. Observation of zoo volunteers' activities suggests that the volunteers place most emphasis on the zoos' role in conservation and contributions to breeding programs. This is, however, strongly linked to the zoo's enrichment program. Volunteers also occasionally provide guided tours for tourist groups, school visits and other groups such as tertiary institutions.

As described above, the zoo management considers education of general zoo visitors as a key role of the organization. The zoo also targets schools specifically for education purposes. The zoo has a full time education officer, who is a registered and trained teacher, holding the responsibility for dealing with school groups but not general zoo visitors. Educational services are offered to school groups, but not pre-school or tertiary level students. The role of the education officer is to prepare education programs and resources for use at the zoo, to deliver educational sessions to classes while on site, and to help teachers to prepare for zoo visits for school groups. Schools attend a presentation before going on a tour, with the tour conducted by zoo volunteers rather than the education officer or permanent staff. The education officer sends out extensive literature to teachers prior to visits, and the exact details of the presentation are negotiated with the teacher before the visit. As might be expected, there are many suggested learning activities associated with the science curriculum, some examples of which are illustrated in Table 3. Technology education is a strong learning focus and a common presentation for both technology and science is exhibit or enclosure design, which is, for example, linked to the *Technological Knowledge and Understanding* strand of the New Zealand *Technology Curriculum* (Table 3). Learning opportunities also are provided outside science and technology curricula, such as the *English* and *Social Studies*.

Examination of the zoo educational materials thus emphasizes the enormous potential of the zoo for learning within the New Zealand curriculum statements and objectives. The bulk of school groups are in fact primary school level (age range 5 – 10 years). The zoo provides substantial discounts in entry fees for school groups visiting as part of curriculum activities with the cost being NZ$3.50 (ca. US$1.40) per student. This begs the question as to why secondary schools in particular fail to make use of the zoo as a learning opportunity. Interviews with secondary school teachers provided some reasons. Many of teachers interviewed seemed not to even consider the zoo as a source of curriculum related activity, with, for example, one teacher commenting, "We have not taken any classes to the zoo. We are not adverse to the idea of a visit, but no teachers have expressed the desire to do so. Our present Form 1 [i.e., Year-10] science-teacher is looking at the possibility of visits in the future. It is really a matter of how it fits best into the school curriculum." This view echoes that of the primary school teacher in this study that took her classes to the zoo (see below); in other words, the zoo could be a source of curriculum activity, but there are other options available. These other options may be simpler in purely logistical terms as seen in further comments by the secondary school teachers, some of whom were distant from the zoo: "the main concern is the cost of transport to visit zoos. If possible we tend to use local facilities that are closer." Other options, very close to the school, tended to be the preferred option: "closer, more local places like the Agridome [a farm-based interactive tourist attraction] offers a few of these trips. But often we cannot afford the time out of class." Others commented that they would have to employ relief teachers at additional cost. Secondary schools teachers are subject specialists and this means schools need to employ relief teachers to cover their classes during their absence on the zoo visit. This cost is borne by the students, making the overall cost unacceptably high: "It is Board policy that the students pay for the costs of the relief teacher – NZ$220 per day on top of travel and incidental expenses which makes it simply not viable." Finally, teachers pointed out that "a science based trip needs to be justified as to why they will be absent from all other classes during the day. At the moment no lesson plans or learning outcomes have been written for an excursion to the zoo. That isn't to say that there wouldn't be any learning possible or something to relate to our prescription or curriculum." Hence, costs and the pressure of a packed secondary school curriculum represent significant disincentives for off-site visits including zoo visits. Those few secondary teachers that did take students to zoos, typically combined curriculum areas; "I have used the zoo as a teaching aid. I took the students up to Auckland for about three or four days. English, art and biology worked together to make the visit cover curriculum areas. I took biology students to the zoo to look at primates to help them have practical experience on part of the human evolution topic for Form 7 [i.e., Year-13] biology." Other made similar comments, "the aim of doing the art at the zoo is to give the children some variety in lessons and a break from the usual fare of science related zoo topics."

The primary school involved in this inquiry was a state co-ed elementary school with a roll of ca. 300. The children were aged in the range 6-7 years and of mixed ability, some particularly able, others less academically able. The school is situated in a low decile city suburb (i.e., low socio-economic region). The teacher, an experienced female primary school teacher, had not taken the class to this or any zoo before, and the zoo visit was seen by the teacher to be predominantly for "entertainment, fun. They have been really good lately and we have not been anywhere this term. I always like to take them somewhere each term." The teacher made the decision to visit the zoo herself, based on some public domain publicity material including large photos of

animals, and considered zoo visits to be good for children. Being a low decile school, the visit was seen as an opportunity that "they never get, these kids' families don't do things like go for a bush walk, go to the zoo. Entertainment for them is more likely to be movies, videos and play-stations." She had no particular expectations for the visit seeing it as a chance for the children to "go and see things, animals that they haven't seen before," and the teacher was quite emphatic about the purpose of the visit being entertainment. However, probing and classroom observation revealed that considerable pre-planning had been done. For example, she stated:

> We go to see the technology part, the enclosure part. We want to see how they satisfy the animal's needs. And then we are going to come back and design one, because that's part of our technology curriculum. And it so happens that we haven't done that yet. It fits within my curriculum needs, but I could have taken them out to any place, but it's just a fun thing, something fun to do.

Children were shown photos of animals (provided by the zoo as an advertisement in local papers) and had a clear focus; seeking to establish what an animal 'is', 'has', 'does' and where it 'lives'. Each child was assigned to a group (ca. 4-5 individuals) and instructed to 'fill in' each of the four concepts above on their sheets. Children were then expected to visit a variety of animals, and to seek out their specific animal and investigate its enclosure, seeking to see if the enclosure satisfied the animals' needs.

The children were clearly excited about the prospect of the zoo visit, seeing the visit as an opportunity to see animals for themselves. Most children reported owning domestic animals like guinea pigs, cats and dogs, and the animals anticipated were a mixture of realistic expectations "camel," "monkeys," "apes," "tigers," "koala," "kiwi," "little cubs," and unrealistic (for this zoo) such as "whales," "hyenas," and "dolphins." The children had little appreciation of why they were going to the zoo other than to see animals, and likewise little idea of what was planned as post-visit activities. They confused other classroom activities they had been involved in, such as investigating "flax for bugs and things living on it," with pre-visit activities specifically related to the zoo visit. Their post-visit expectations were simple, wanting to "study things" and they expected to "have lunch," "write what you have seen," "write a story," "write a poem," "do some writing" or "draw some lions, 'cos they are easy to draw, and monkeys too, they are easy to draw."

The zoo visit was of about three hours duration and the two classes (each of ca. 35 students) were accompanied by teachers and parent/care-givers as helpers. The latter individuals were told of the visit objectives, namely to seek out specific enclosures and 'fill in the boxes' before the visit. The visit began with a presentation by the zoo educational officer specifically about animal needs, carefully related to exhibit design and environmental enrichment. The officer first took the classes to a generation one exhibit (the barn owl house), a small, simple, wooden enclosure with plastic netting confining the birds. This was described as "not my favorite enclosure" because "it is old" and "not very nice." Some needs of these animals were gently teased from the children, resulting in them using quite sophisticated terms such as "nocturnal," "endangered," and "habitat," and the competing tensions between the needs/desires of the three stakeholders, that is, visitors, animals and zookeepers, of the exhibit carefully probed. For example, it was pointed out that the barn owl prefers to sleep during the

day, which is a time when most visitors go to the zoo to see animals. The children were then taken to the rhinoceros exhibit (generation three), and the advantages for each of the three stakeholders resulting from the more advanced enrichment of this exhibit elucidated. This was not confined to merely discussing the aesthetically pleasing features of the exhibit, but exhibit features were related to species typical behavior; for example, the use of mud as a sun block was discussed in some depth. An interesting event occurred during the visit to the rhinoceros exhibit. The male defecated spectacularly, much to the disgust of the children. However, this provided a rich leaning opportunity as the officer immediately predicted the subsequent behavior, namely, a second animal defecating on the same spot and the two animals trampling faeces onto their back feet. This, it was explained to the children, represented "typical behavior of animals in the wild" showing "us that these animals are happy in their enclosure," and the use of animal scent related to natural behavior being "marking of territory." It was also explained that the animal's faeces were useful for ascertaining "animal health via scientific analysis."

The talk completed, the children went on their zoo visit, beginning with a rather rapid trip around the entire zoo. The children spent most of the time seeking out animals, and were, for example, disappointed in the free-flight, since it was difficult to spot birds and the commonness of the birds was seen as "boring it's only a Tui [a common native New Zealand bird]." Some common domestic animals, however, were of interest, the pigs because of their "grossness" and "smelliness," and ease of access, and some small ducklings just hatched described as "cool" and "cute." As seen for general zoo visitors, time spent at a given enclosure was minimal, less than one minute in the case of the school children. This applied even to exhibits containing animals like Sumatran tigers and the free-flight aviary; the latter was mostly of interest since it contained an artificial waterfall. Unusual animals or features attracted brief interest, the tapir: "look at their big noses," and the giraffe: "look at how big it is next to that small house." Two animals in particular held their attention, the camel, which at the time of the visit happened to be very close (within touching distance) and the children were curious as to whether or not the camel would "spit" or "bite." The primates attracted more interest, with the capuchin monkeys in particular, relatively active at the time of this particular visit. The children were absorbed, noting many aspects of the capuchins appearance and behavior, "look at their feet," "look at that little one sleeping," "oh it's jumping - cool," "it's holding one [piece of fruit] in its hand, it's eating kiwifruit [a local fruit] it's trying to break it up." The children clearly considered the capuchins to be happy; observing: "doesn't it look like fun" when viewing the animals swinging from the wire walls of their enclosure. After approximately 90 minutes the children were visibly tired, complaining, "I'm tired," and saying "I want to go back now." After a lunch break the children went to exhibits they had not seen and completed their visit by observing the specific animal exhibits targeted before the visit. They copied down relevant information from signs, like "mammal," "Sumatran tiger," and noted some specific features of the animals like the capuchins "fur" and size, "it's really small." The adult supervisors made some attempts to engage children in reading of signs "think about that enclosure, is that good for all, us, the camel, the keepers?" But in general these were rare events, with a fair amount of the time spent on logistics of the visit such as keeping the groups together, encouraging the children to keep moving, and occasionally providing safety advice trying to avoid children being bitten by animals such as the ostrich.

The teacher was pleased with the way the zoo visits went, "really well they had fun, they enjoyed themselves which was the major reason for the visit." She went on to discuss some logistical differences, "next time I would do it as a single class," then you can arrive and have your walk around and do your own thing." The time constraint was also seen as a problem, "I think I would make it slightly longer, lots of people didn't see everything." The education officers' talk at the beginning she thought valuable, "the nature of the talk was good, great, the content was good, perfect," and pitched at exactly the right level for the children. The only other comment she made was related to class management: "our children need to be confined, in a fixed area, and that's just my class. They are little bit hairy, they just need to sit down, be enclosed a bit more [laughs]."

Overall, she thought that the children gained a lot from the trip:

> One of the objectives was the technology part and I think that the children found out how the zoo caters for the animals. I think they can tell the difference between a good and a bad enclosure, they saw animals that they won't see again, and I think they were quite awestruck by some things. Like I don't think they were inspired by the tiger, but they saw a tiger, that's the inspiring part, just having seen a tiger. When they see it on television, they can say, 'I've seen a tiger'.

In her view the children's favorite animals were "the monkeys, everyone's impressed by the monkeys." She saw this as strongly related to the nature of the exhibit: "it was tall, it was high and everyone got a good view. They were absolutely amazed at the monkeys climbing up the walls, putting their fingers through the webbing." She further commented that the design was good for visitors, "you come into it right in the middle [of the enclosure height-wise] and you can look up and down."

Post-visit activities were focused on the pre-visit objectives; specific classroom activities, included finishing the details of the 'is', 'has', 'does' and 'lives' questions that were begun during the zoo visit - filling out the sheets including drawing a plan of the enclosure, combining their exhibit designs and answers, and building an exhibit in the school play area (see, Figures 12-14).

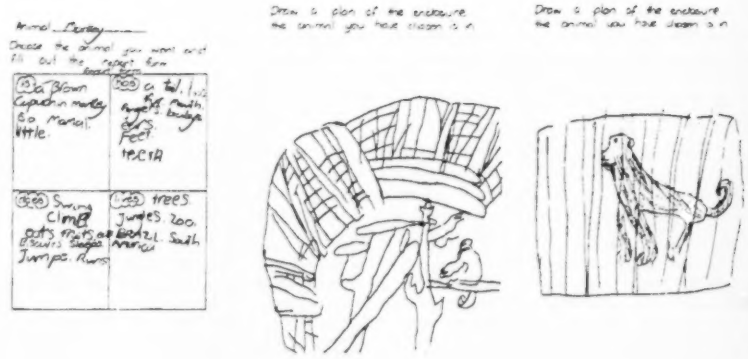

Figure 12
Examples of the children's post-visit drawings of exhibits

Figure 13
Examples of the children's post-visit drawings of exhibits and animal needs

She saw the zoo visit experience as "inspiring" and followed the classroom activities up with discussion related to the technology curriculum: "how that enclosure meets the monkey's needs. So that if you don't have a suitable enclosure for the money to swing he will get bored,"

The children, as noted by the teacher, were highly excited about their visit. They reported that they enjoyed their trip because they saw "animals, all sorts of animals," "people go there to visit the animals," the visit being exciting because of the new experiences: "it was the first time I have seen tigers." Their principal enjoyment came from seeing animals with some obvious favorites: "I liked the tigers, I liked their cage" and the primates: "I liked the [spider] monkeys because they were swinging around," "they swinged on the fence," "it swinged in really close to us," "I liked the monkeys because there was a little one and it like poked it's tongue." Unusual events were particularly entertaining, and, for example, one of the ring-tailed lemurs "got out while we were there." Disliked exhibits were "the owl, I didn't like the owl because it didn't move" and "owl's house, it was actually pretty dark in there and it was real small."

Figure 14
Examples of the children's post-visit constructions of exhibits

The children enjoyed unexpected events. Aside from the rhino's activities described as "his big plops [giggles]," they enjoyed seeing monkeys swing, and an encounter with the "blue duck," the rather aggressive native duck mentioned above: "it has to be confined because it beats up other ducks." They enjoyed the visit seeing it as a valuable activity, again because "other people should go so they can see the animals," they wanted other people "from other cities, countries or towns to see monkeys swinging." After the zoo visit they said they had "studied the zoo," the monkeys and tigers again favorites. They spoke of the 'is', 'has', does', and 'lives' activities describing their own examples, using the animals mentioned above. So monkeys were "mammals" that "swing" and are involved in "climbing", and that live in "trees," and "other countries." The purpose of the enclosures were seen to be to "keep the animals safe," and "keep the animals in good health." The children kept returning to the monkeys, clearly greatly impressed: "I drew a monkey in my book, swinging" (see, Figure 12), making only brief mention of other animals when gently probed: "I saw otters," and "I saw the red panda," "I saw a tuatara [a native lizard]."

Interestingly, the children said they liked seeing animals, but also made mention of specific exhibits: "I liked the rhinoceros's enclosure." It is interesting to note throughout the children's adoption of terminology, in that they specified they liked the "rhinoceros" and his "enclosure," rather than 'rhino' and 'cage.' Similarly, they made some highly insightful observations about exhibits; for example, stating that the role between animal and visitor appeared to be in the case of the Sumatran tiger exhibit: "I liked the tiger enclosure best, because we were inside, and they were outside."

Conclusion and Implications

The actual zoo use and visitor perceptions for the participants in this study were similar to those described in the literature. For example, the visitor's, including school groups, found the enriched exhibits more appealing (Kaplan & Kaplan, 1989), and spent more time at more natural exhibits (Swenson, 1984) with most time spent seeking out animals (Tunnicliffe, 1995a,b). The children in particular focused on anatomical features (e.g., size) and animal activity, and engaged in sign reading only when directed to via pre-visit instruction (Anderson et al., 2000). Older visitors seemed less concerned about 'cagey' type exhibits than their younger cohorts as suggested by Verderber et al. (1988)

The research findings for this inquiry suggest that the zoo in question sees itself as having an important role in free choice learning, with their educational efforts strongly linked to the environmental enrichment program. If one is to judge success of the enrichment program on the basis of visitors' perceptions, then the zoo has achieved a high level of visitor satisfaction with visitors rating the most enriched exhibits more favorably. The zoo, via exhibit design, also affords the visitors the opportunity to bond closely with specific animals; the most notable example being the rhinoceros exhibit. The most likely explanation for the lower rating of some environmentally enriched exhibits is the difficulty associated with observing the animals during the duration of this inquiry, as suggested by Bitgood et al. (1988). Zookeepers and management recognize that enrichment activities may involve more effort and resources in terms of upkeep and maintenance, but staff believe that this is compensated for in terms of visitor pleasure and animal welfare.

The study reveals that general zoo visitors and school teachers and school groups do not necessarily associate zoo visits with learning. Nonetheless, learning did occur during visits to this zoo. For the general zoo visitors this was limited, whereas for the school groups in this study, there were strong learning outcomes with children developing an understanding of animal needs and welfare, and a surprisingly sophisticated view of exhibit design. This learning was facilitated by pre-planning and appropriate post-visit activities, along with the technology-focused presentation by the zoo education officer. The children's learning appeared to be most effective when targeted to specific activities, such as animal needs and exhibit design. Hence, as reported elsewhere for free choice learning centers, learning is more likely to occur when children (and other visitors) go to the zoo with specific learning objectives and engage in appropriate pre- and post-visit activities (Anderson et al., 2000; Bolstad, 2001), and it is recommended that teachers plan accordingly, linking their visits to specific curriculum objectives.

The findings from this study suggest that a zoo visit to a modern zoo with a high level of environmental enrichment provides exhibits pleasing to visitors, and stimulating entertainment that provides many opportunities for free choice learning. The study also suggests that free choice learning occurs whether or not it is recognized as such by visitors. Hence zoos, such as the one in this study, may serve to bridge St John and Perry's (1993) 'critical disjunction,' by providing opportunities for learning that are connected with everyday life, that also are enjoyable, entertaining experiences.

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